

I CLAIM:

1 1. A communication system comprising: a first bridge, and a second bridge
2 serially connected to the first bridge, to provide a serial communication interface between
3 a first device layer such as an asynchronous transfer mode (ATM) layer and a second
4 device layer such as a physical (PHY) layer; the first bridge being connected according to
5 an established protocol to the first device layer, the first bridge being transparent to the
6 first device layer and programed to represent the second device layer to the first device
7 layer; and the second bridge being connected according to the established protocol to the
8 second device layer, the second bridge being transparent to the second device layer and
9 programed to represent the first device layer.

2 2. The communication system of claim 1, wherein the first and second bridges
3 each include an establish protocol interface, the established protocol interface being
4 programmable to be a first device layer interface when programmed to be a first
5 interface, and a second device layer interface when programmed to be a second interface.

1 3. The communication system of claim 2, wherein the established protocol
2 interface includes a programmable means for programming a plurality of modes of
3 operation according to the established protocol.

1 4. The communication system of claim 1, wherein at least a single second bridge
2 includes a means for communicating with a plurality of second device layers.

1 5. The communication system of claim 2, wherein the first and second bridges
2 each include a down bridge direction and an up bridge direction and wherein each bridge
3 in the down bridge direction includes an assembler means for converting an established
4 protocol cell to a transport container for transmitting over the serial connection.

1 6. The communication system according to claim 5, wherein each bridge includes
2 a means for detecting back pressure operatively connected to the assembler means and the
3 assembler means includes a means for embedding the detected back pressure into the at
4 least one control byte.

1 7. The communication system according to claim 5, wherein the transport
2 container further includes an error code and each of the first and second bridges include a
3 means for generating an error code on at least a first portion of the transport container
4 operatively connected to the assembler means and the assembler means includes a means
5 for assembling the error code into the transport container.

1 8. The communication system according to claim 5, wherein the transport
2 container includes a header, and a payload field and the assembler means includes a
3 means for embedding an alarm and signal code into the transport container.

1 9. The communication system according to claim 5, wherein each bridge includes
2 a parity generator and checker operatively connected to the serial communication
3 interface for generating a parity code and operatively connected to the assembler means
4 and the assembler means includes a means for embedding the parity code into the
5 transport container.

1 10. The communication system of claim 2, wherein the first and second bridges
2 each include a down bridge direction and an up bridge direction and wherein each bridge
3 in the up bridge direction includes a disassembler means for converting a transport
4 container to the established protocol cell for transmitting over the established protocol
5 interface.

1 11. The communication system according to claim 10, wherein the transport
2 container includes a back pressure indication and the disassembler means includes a
3 means for disassembling the pack pressure indication.

1 12. The communication system according to claim 10, wherein the transport
2 container further includes an error code and the disassembler means includes a means for
3 disassembling the error code.

1 13. The communication system according to claim 11, wherein the transport
2 container further includes an embedded alarm and signal code and the disassembler
3 includes a means for extracting the embedded alarm and signal code.

1 14. The communication system according to claim 13, wherein each bridge
2 includes a parity generator and checker operatively connected to the serial communication
3 interface for checking a parity code assembled the transport container.

1 15. In a communication system comprising a first bridge, and a second bridge
2 serially connected to the first bridge, a method for providing a serial communication
3 interface between a first device layer such as an asynchronous transfer mode (ATM) layer
4 and a second device layer such as a physical (PHY) layer including the steps of;

5 connecting the first bridge being according to an established protocol to the first
6 device layer;

7 programing the first bridge to represent the second device layer to the first device
8 layer and to be transparent to the first device layer;

9 connecting the second bridge according to the established protocol to the second
10 device layer; and

11 programming the second bridge to represent the first device layer and to be
12 transparent to the second device layer.

1 16. The method according to claim 15, wherein the first and second bridges each
2 comprises an established protocol interface and the step of programing the first bridge
3 includes the step of enabling the established protocol interface of the first bridge to
4 communicate with the first device layer and the step of programing the second bridge
5 includes the step of enabling the established protocol interface of the second bridge to
6 communicate with the second device layer.

1 17. The method of claim 15, further comprises the step of programing the
2 established protocol interface to a first mode of operation selected from a plurality of
3 modes of operation according to the established protocol.

1 18. The method according to claim 17, further includes the step of
2 communicating with a plurality of second device layers from at least a single second
3 bridge.

1 19. The method according to claim 15, wherein the first and second bridges each
2 include a down bridge direction and an up bridge direction and wherein for each bridge in
3 the down bridge direction the method includes the steps of:

4 converting an established protocol cell to a transport container; and
5 transmitting the transport container over the serial connection.

1 20. The method according to claim 19, wherein the step of transmitting the
2 transport container over the serial connection includes the step of transmitting a fame of a
3 predefined number of transport containers.

1 21. The method according to claim 20, further including the steps of: generating
2 an error code of at least a first portion of each transport container; and assembling the
3 error code into the transport container having the first portion on which the error code
4 was generated.

1 22. The method according to claim 21, further including the step of marking a
2 predetermined transport container of the frame by modifying the error code assembled in
3 the predetermined transport container.

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1 25. The method according to claim 20, further comprising the step of: arranging
2 the plurality of transport containers into the frame of N blocks wherein N is a positive
3 number with each block including M transport containers where M is a positive number
4 and each transport container includes at least one control byte, the step of transmitting the
5 transport containers includes the step of sequentially transmitting a first transport
6 container of a first block through a last transport container of a last block.

1 26. The method according to claim 25, wherein each transport container includes
2 a plurality of bytes and each byte includes a plurality of bits and the method further
3 comprises the step of generating a bit interleave parity code over Q transport containers
4 of a group of N/P blocks where Q is a positive number less than M and P is a positive
5 number.
6

1 27. The method according to claim 26, wherein P is equal to 1 and the method
2 includes a step of embedding the bit interleave parity into the at least one control byte of
3 the of the last , transport container of the last block.

1 28. The method according to claim 26, wherein P is greater than 1, and N/P equal
2 to P equal sections of blocks and the method includes a step of embedding the generated
3 bit interleave parity into the at least one control byte of the of a last transport container of
4 a first section of blocks.

1 29. The method according to claim 25, further includes the step of embedding
2 communication information into at least one control byte in a predefined transport
3 container of each block.

1 30. The method according to claim 29, wherein the step of assembling
2 communication information into at least one control byte in a predefined transport
3 container of each block includes the step of embedding alarm information into the at least
4 one control byte.

1 31. The method according to claim 29, wherein the step of assembling
2 communication information into at least one control byte in a predefined transport
3 container of each block includes the step of embedding a parity code into the at least one
4 control byte.

1 32. The method according to claim 25, further includes the step of embedding
2 back pressure information in the at least one control byte in selected transport containers.

1 33. The method according to claim 32, wherein each block represents a sub-port
2 with each sub-port being capable of connecting to a plurality of ports and each of one of a
3 plurality of bits in the at least one control byte being used to identify a port with back
4 pressure, the step of assembling back pressure information in the at least one control byte
5 in selected transport containers includes the step of setting a first logic state in a bit
6 identifying the port with back pressure.

1 34. The method according to claim 15, wherein the first and second bridges each
2 include a down bridge direction and an up bridge direction and wherein each bridge in the
3 up bridge direction includes the steps of:
4

5 receiving a transport container having a plurality of bytes with each byte
6 comprising a plurality of bits;

7 converting the transport container to an established protocol cell; and

transmitting the established protocol cell over the established protocol interface.

1 35. The method according to claim 34, wherein the transport container includes a
2 header, and a payload field and at least one control byte and the method includes the step
3 of detecting back pressure to the first bridge and the second bridge from the at least one
4 control byte.

1 36. The method according to claim 34, wherein the transport container includes a
2 header, and a payload field and at least one control byte and the method include the step
3 of performing an error check on at least a first portion of the transport container from an
4 error code stored in the at least one control byte.

1 37. The method according to claim 34, wherein the step of receiving the transport
2 container includes the step of receiving a frame having a predefined number of transport
3 containers.

1 38. The method according to claim 37, wherein each transport container includes
2 a header, an error code field and a payload field and the method include the step of
3 checking an error code of at least a first portion of each transport container.

1 39. The method according to claim 37, further including the step of detecting a
2 marking in a predefined transport container of the frame of transport containers.

1 40. The method according to claim 37, further including the step of checking a
2 parity code on the frame from the parity code stored in a predefined transport container.

1 41. The method according to claim 40, wherein each transport container includes
2 at least a control byte and the step of checking the parity code in the predefined transport
3 container includes the step of detecting a parity code in the at least one control byte and
4 checking the detected parity code for errors.

1 42. The method according to claim 37, wherein the frame being composed of N
2 blocks of transport containers where N is a positive number with each block including M
3 transport containers where M is a positive number and each transport container includes
4 at least one control byte, the step of receiving the transport containers includes the step of
5 sequentially receiving a first transport container of a first block through a last transport
6 container of a last block.

1 43. The method according to claim 42, wherein the method further comprises the
2 step of detecting a bit interleave parity code generated over Q transport containers of a
3 group of N/P blocks where Q is a positive number less than M and P is a positive
4 number; and checking the detected bit interleave parity code.

1 44. The method according to claim 43, wherein P is equal to 1 and the step of
2 detecting a bit interleave parity code generated over Q transport containers of a group of
3 N/P blocks the method further includes a step of detecting the generated bit interleave
4 parity in the at least one control byte of the of the last transport container of the last
5 block.

1 45. The method according to claim 43, wherein P is greater than 1, and where in
2 the frame is partition into N/P equal sections of blocks and the method includes a step of
3 detecting the bit interleave parity in the at least one control byte of the of a last transport
4 container of a first section of blocks.

1 46. The method according to claim 42, further includes the step of detecting
2 communication information in the at least one control byte in a predefined transport
3 container of each block.

1 48. The method according to claim 46, includes the step of detecting a parity code
2 in the at least one control byte in a predefined transport container of each block.

1 49. The method according to claim 42, further includes the step of detecting back
2 pressure information in the at least one control byte in selected transport containers.

1 50. The method according to claim 49, wherein each block represents a sub-port
2 with each sub-port being capable of connecting to a plurality of ports and each of one of a
3 plurality of bits in the at least one control byte being used to identify a port with back
4 pressure, the step of detecting back pressure information in the at least one control byte
5 in selected transport containers includes the step of detecting a first logic state of a bit
6 identifying the port with back pressure.

1 51. The method according to claim 42, wherein each transport container includes
2 an error code generated over at least a first portion having a bit width equal to the
3 number of bits in the at least first portion of each transport container and the step of
4 receiving the frame of transport containers include the step of establishing transport
5 container synchronization from the error code.

1 52. The method according to claim 51, wherein the step of establishing transport
2 container synchronization from the error code further includes the step of continually
3 checking for a no error indication over a bit width equal to the bit width of the at least the
4 first portion.

1 53. The method according to claim 52, further includes the step of receiving a
2 plurality of frames and wherein the error code is a CRC polynomial code and each frame
3 includes a synch transport container and the step of receiving the plurality of frames
4 further includes the step of establishing frame synchronization.

1 54. The method according to claim 53, wherein the error code in the synch
2 transport container includes a combination of the CRC polynomial code and a coset of the
3 CRC polynomial code and the step of establishing frame synchronization includes the
4 step of checking the error codes in each transport container for a no error condition in the
5 combination of the CRC polynomial code and the coset of the CRC polynomial code.